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(71) Applicant
Forth & Foyle (Erection Services) Ltd

(Incorporated in United Kingdom)

Praron House, Abbots Road, Grangemouth, FK3 8HX, Scotland

(72) Inventor
Frank David Wharton

(74) Agent and/or Address for Service
Fitzpatricks
4 West Regent Street, Glasgow, G2 1RS

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(54) Electrostatic precipitators

(57) The electrostatic precipitator has upright curtains 11 comprising metal collector plates 12 meshed together and closely spaced, vertical discharge electrodes 13 (arranged in frames), equispaced from the curtains and spacers 14. The spacers 14 are on the same horizontal plane and are connected to straps 15, 16 which extend in parallel along the opposed curtains, being fixedly secured to one of the straps and connected to the opposed strap by spigot and socket means 18. The spacers 14 may be of ceramic or mild steel. Each row of discharge electrodes 13 is supported by a lateral banding (30, Fig. 5) of wire or banding straps disposed substantially centrally relative to the length of the electrodes or alternatively, as two lateral bandings along the upper and lower portion of the electrodes.

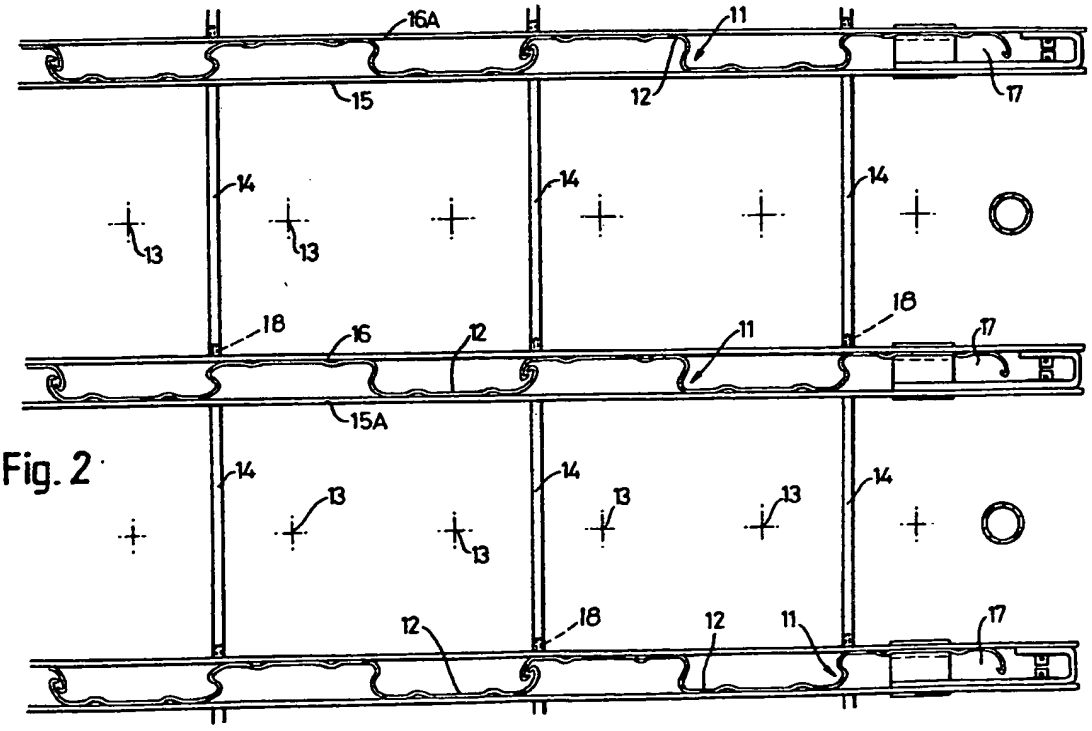

Fig. 2

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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

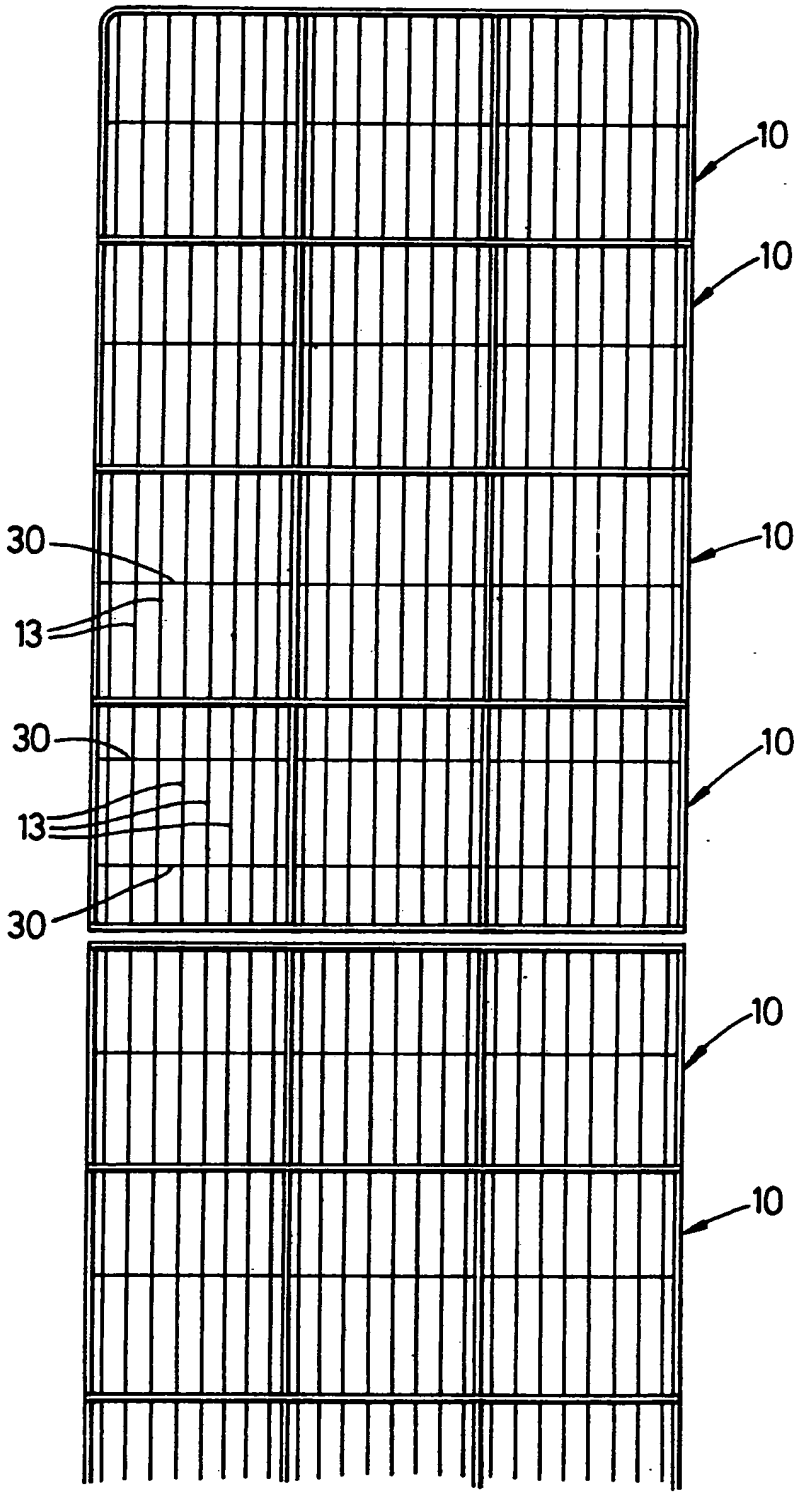

Fig. 1

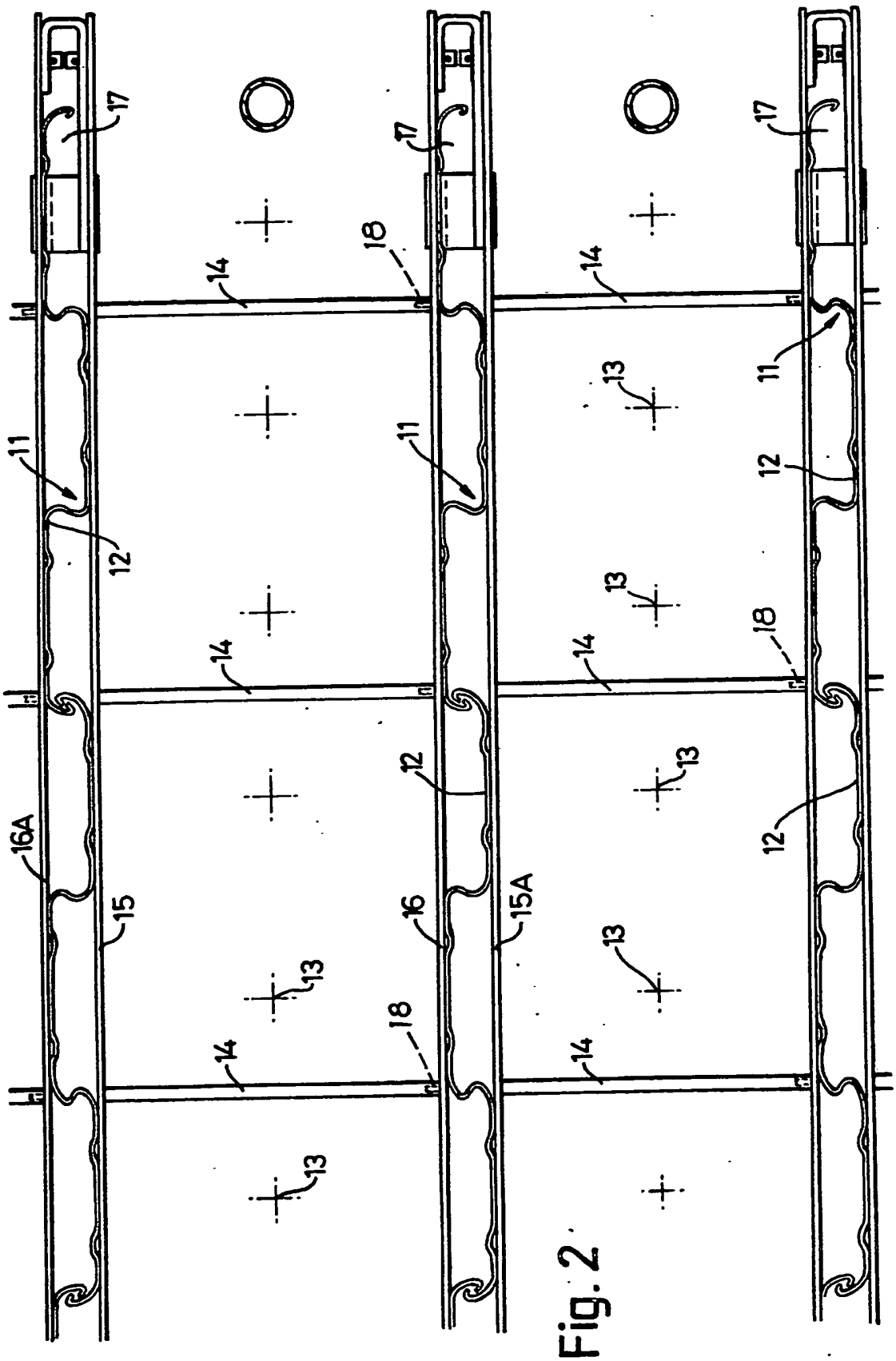

Fig. 2

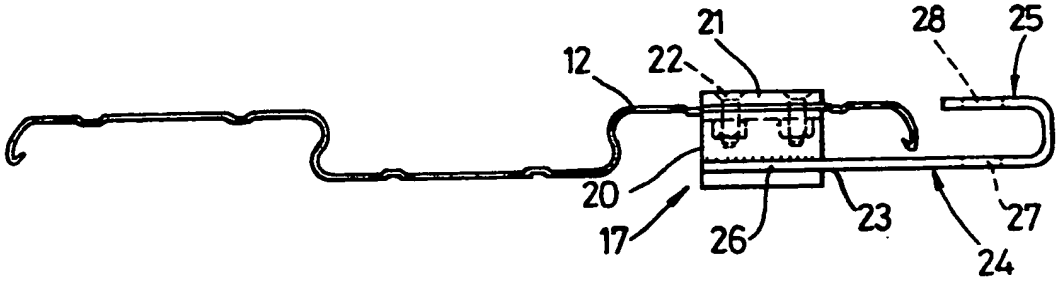

Fig. 3

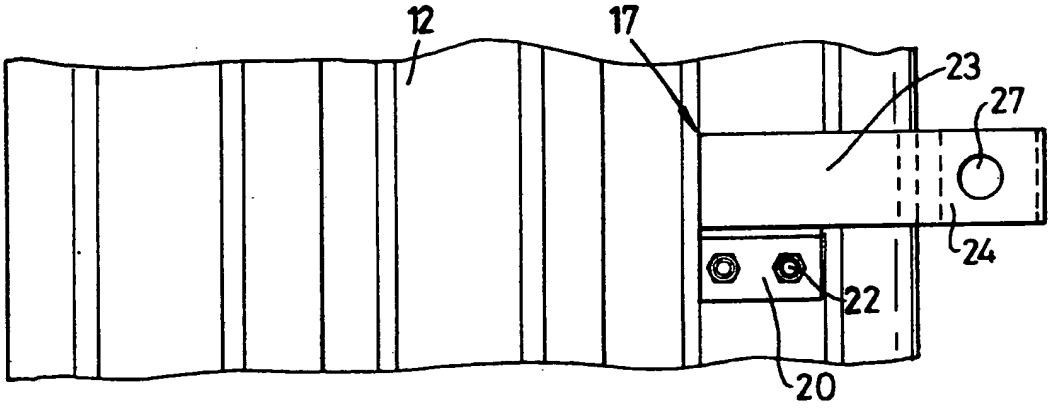

Fig. 4

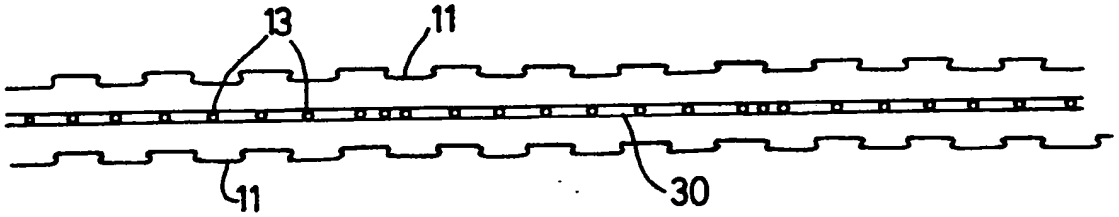

Fig. 5

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ELECTROSTATIC PRECIPITATORS.

This invention relates to electrostatic precipitators.

Precipitators are made up of a number of upright curtains stacked vertically, and each curtain comprises a series of parallel electrodes each made up of metal collector plates meshed together and closely spaced (22.9cm/ 9" apart) with rows of vertical discharge electrodes (arranged in frames), equispaced from the curtains.

A major problem with such a construction is that the curtains tend to warp or become unmeshed and consequently the air gap between the collector plate and the adjacent discharge electrode decreases causing a short circuit. As a result, there is a loss of precipitation not only at the affected electrode but at all other electrodes in the same field.

There may, for example, be four fields and on occasion, three out of the four could be affected by the above problem.

An object of this invention is to obviate or mitigate the aforesaid problems.

Another problem is that the discharge electrodes tend to break at specific locations, namely (10.16cms to 15.24cms/ 4" to 6") from the point of attachment, top and bottom, to a frame. This can result in movement of the rod, towards a curtain of up to (10.16cms/ 4" particularly if the break occurs at the top end of the rod and again the result may be loss of precipitation over the entire field.

Another object of this invention is to obviate or mitigate the above problem.

According to one aspect of the present invention, there is provided an electrostatic precipitator having a number of upright curtains each curtain comprising a series of parallel electrodes each made up of metal collector plates meshed together and closely spaced, and with rows of

vertical discharge electrodes equispeced from opposed curtains, and wherein a series of laterally spaced spacer members extend between opposed curtains, each spacer member is being disposed between a pair of adjacent discharge electrodes.

Preferably, the spacer members are disposed equidistant from a pair of adjacent discharge electrodes.

Preferably also, the spacer members are on the same horizontal plane.

Preferably also, the spacer members are connected to straps which extend in parallel along the opposed curtains.

Preferably also, the spacer members are fixedly secured to one of the straps and connected to the opposed strap by spigot and socket means.

Preferably also, the spacer members are formed of ceramic material, or of mild steel.

According to a further aspect of the present invention, there is provided an electrostatic precipitator having a number of upright curtains each curtain comprising a series of parallel electrodes each made up of metal collector plates meshed together and closely spaced, and with rows of vertical discharge electrodes equispaced from opposed curtains, and wherein each row of laterally spaced discharge electrodes is supported by a lateral banding.

Preferably the lateral banding is disposed substantially centrally relative to the length of the electrodes.

Alternatively, two lateral bandings are provided along the upper and lower portion of the electrodes.

The banding may be metal wire or banding straps.

Embodiments of the present invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is an elevation of an electrostatic precipitator according to the invention;

Fig. 2 is a plan view to an enlarged scale of a portion of an electrostatic precipitator according to one aspect of the invention;

Fig. 3 is a plan view of a support bracket and an end plate of the collector curtain;

Fig. 4 is a front elevation of Fig. 2 and

Fig. 5 is a plan view according to another aspect of the invention.

Referring firstly to Figs. 1 to 4, the electrostatic precipitator is made up of a series of frames 10 in stacked disposition. Each frame is, for example (1.7m/5' high by 3.86m/12'8" long) and seven frames are used to give an overall height of (10.67m/35'). Each frame comprises a series of parallel collector walls or 'curtains' 11 made up of metal plates 12 which intermesh about vertical edges, the plates being castillated in plan. The curtains 11 are spaced at (.23m/9" intervals) and between each pair of curtains is a row of discharge electrodes 13 in the form of wires carried on a framework (not shown). The wires 13 are equispaced from the curtains 11 and from each other.

In use, the electrodes energise dust particles which are attracted to the plates of the collector curtains.

In order to maintain the air gaps between the electrodes 13 and the curtains 11 a row of spacer members 14, in the form of ceramic tubes extend between opposed walls of adjacent curtains. Alternatively the spacers are of mild steel.

The spacer tubes 14 do not directly engage the plates 12 of the curtains but are mounted on a pair of metal straps 15, 16 which extend along the opposed face of each curtain. Brackets 17 are bolted to each end of each curtain and the strap 15 or 16 seats on these brackets and is bolted thereto. The same pair of brackets also carry a strap 16A or 15A at the other side of the curtain.

For assembly purposes, the spacer tubes 14 are fixedly attached by adhesive to one of the pair of straps, strap 15. The other strap 16 has spigots 18 which locate in the end of the respective tubes.

To assemble the spacer tubes, the spigot carrying strap 16 is installed and the curtains eased apart to slightly increase the distance between them, the strap 15 carrying the spacer tubes is introduced into the space between its curtain and the row of electrode rods, with the spacer tubes upright. When the spacer tubes are at the correct position relative to their spigots 18, the strap 15 is turned through 90^{o} and seated on its brackets 17. With the spigots 18 aligned with the tubes 14, the pressure holding the curtains apart is released so that the curtains resume their correct spacing and the spigots locate in the tubes.

Tubes 14 may be provided between each two electrode rods, but preferably, as indicated in Figs. 2, the tubes 14 are located between every other pair of rods 13.

The spacer tubes prevent the curtain warping or becoming unmeshed, thus maintaining the air gap.

The row spacer tube is located centrally relative to the height of the frame.

The bracket 17 has a fixing plate 20 reversed L section for location on one side of an end plate 12 of the curtain, and a flat plate 21 for location on the other side of each plate 12, the two plates 20, 21 being connected together onto the end plate by bolts 22. The fixing plate 20 has an upper horizontal portion to which a support plate 23 is welded, the plate 23 being J shaped in plan as indicated in Fig. 3 to provide a major support face 24 and a minor support face 25. The plate 23 is set back from the edge of the fixing plate so as to provide a ledge 26 on which the spacer carrying strap 15 seats. The end portion of the strap 15 lies face to face against

the major support face 24 of the plate 23 and is secured by a bolt, through a bolt hole 27 in the plate 23. The flat plate 21 forms a ledge for a spigot carrying strap 16A on the other side of the curtain; said strap 16A also engages the minor support face 25 and is secured thereto by a bolt through a second bolt hole 28 co-axial with hole 27.

Referring now to Figs. 1 and 5, each row of electrode 13 in each frame 10 is attached top and bottom to an individual surrounding framework, but in addition, in accordance with the invention, each row of rods 13 has support at one or more locations between the top and bottom ends by provision of a support banding 30.

The banding 30 may be stainless steel wire or banding strap and it runs along both sides of the row of rods along round the sides of the framework.

The banding 30 may be a single bank at mid-height, i.e. in this embodiment at (.762m/2'6") from top and bottom of the framework or two bands on the upper and lower positions, e.g. at (.51m/1'8") from top and bottom of the framework.

The banding can be installed utilizing a self-tensioning device to ensure that correct tension is maintained after heat soak.

The banding 30 will restrict movement of an electrode which breaks sufficiently to prevent the failed electrode from making contact with either of the adjacent collector curtains, thus to ensure continued field operation.

A single, centrally disposed banding will restrict movement of a failed electrode to (5.08cms/2"; a double banding will restrict movement to (2.54cms/1").

Failed electrodes can be removed and replaced during normal maintenance.

The spacer members and the support banding can be installed in existing precipitators as well as being

incorporated into new constructions.

Precipitators having said support banding and/or spacer members will experience an increased efficiency rating and the loss of precipitation will be considerably reduced.

The spacer members may be metallic or non-metallic.

CLAIMS.

1. An electrostatic precipitator having a number of upright curtains each curtain comprising a series of parallel electrodes each made up of metal collector plates meshed together and closely spaced, and with rows of vertical discharge electrodes equispaced from opposed curtains, and wherein a series of laterally spaced spacer members extend between opposed curtains, each spacer member is being disposed between a pair of adjacent discharge electrodes.

2. An electrostatic precipitator as claimed in claim 1, in which the spacer members are disposed equidistant from a pair of adjacent discharge electrodes.

3. An electrostatic precipitator as claimed in claim 1 or 2 in which the spacer members are on the same horizontal plane.

4. An electrostatic precipitator as claimed in any one of claims 1 to 3 in which the spacer members are connected to straps which extend in parallel along the opposed curtains.

5. An electrostatic precipitator as claimed in claim 4 in which the spacer members are fixedly secured to one of the straps and connected to the opposed strap by spigot and socket means.

6. An electrostatic precipitator as claimed in any one of claims 1 to 5 in which the spacer members are formed of a non-metallic material.

7. An electrostatic precipitator as claimed in claim 6 in which the spacer members are formed of a ceramic material.

8. An electrostatic precipitator as claimed in any one of claims 1 to 5 in which the spacer members are metallic.

9. An electrostatic precipitator as claimed in claim 8 in which the spacer members are formed of mild steel.

10. An electrostatic precipitator as claimed in any one of the preceding claims in which each row of laterally spaced discharge electrodes is supported by a lateral banding.

11. An electrostatic precipitator having a number of upright curtains each curtain comprising a series of parallel electrodes each made up of metal collector plates meshed together and closely spaced, and with rows of vertical discharge electrodes equispaced from opposed curtains, and wherein each row of laterally spaced discharge electrodes is supported by a lateral banding.

12. An electrostatic precipitator as claimed in claim 11 in which the lateral banding is disposed substantially centrally relative to the length of the electrodes.

13. An electrostatic precipitator as claimed in claim 11 in which two lateral bandings are provided along the upper and lower portion of the electrodes.

14. An electrostatic precipitator as claimed in any one of claims 11 to 13 in which the banding is metal wire or banding straps.

15. An electrostatic precipitator as claimed in any one of claims 11 to 14 wherein a series of laterally spaced non-metallic spacer members extend between opposed curtains, each spacer member being disposed between adjacent discharge electrodes.

16. An electrostatic precipitator substantially as hereinbefore described with reference to Figs. 1 to 4 of the accompanying drawings.

17. An electrostatic precipitator substantially as hereinbefore described with reference to Figs. 1 to 5 of the accompanying drawings.

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